Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School	6b. OFFICE SYMBOL *(If applicable)* 55	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS *(City, State, and ZIP Code)* Monterey, CA 93943-5000		7b. ADDRESS *(City, State, and ZIP Code)* Monterey, CA 93943-5000
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL *(If applicable)*	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS *(City, State, and ZIP Code)*

10. SOURCE OF FUNDING NUMBERS

Program Element No	Project No.	Task No.	Work Unit Accession Number

11. TITLE *(Include Security Classification)*
An Analysis of Contractor Logistical Support for Nondevelopmental Items.

12. PERSONAL AUTHOR(S) Cain, Wayne C.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT *(year, month, day)*	15. PAGE COUNT
Master's Thesis	From To	March 1993	100

16. SUPPLEMENTARY NOTATION
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

17. COSATI CODES

FIELD	GROUP	SUBGROUP

18. SUBJECT TERMS *(continue on reverse if necessary and identify by block number)*
NDI, Nondevelopmental, Logistical Support, Contractor Support, Communications and Electronics Commands, Commercial Off-The-Shelf, COTS, GPS Receiver.

19. ABSTRACT *(continue on reverse if necessary and identify by block number)*

The purpose of this thesis is to analyze non traditional logistical support approaches for Nondevelopmental Items (NDI). NDI acquisition capitalizes on the use of commercial "state-of-the-art" technologies while providing DOD with effective and economical solutions to near term operational requirements. This thesis primarily focuses upon contractor logistical support strategies which are unique to NDI acquisition programs. Four current NDI programs were researched for logistical implications. These included: 1) the AN/ARN-148 Omega Navigational System, 2) the Secure Telephone Unit III, 3) the AN/PSS-12 Mine Detector, and 4) the AN/PSN-11 PLGR GPS Receiver. The NDI logistical support strategies identified and analyzed were: 1) No support required (discard system upon failure), 2) total contractor support, 3) organic support, and 4) a combination of organic and contractor support. The advantages and disadvantages of these support methods were analyzed. Potential logistical support strategies are identified that may enable U.S. Army program managers to maximize the benefits of using individualized and tailored support strategies for NDI acquisition. This thesis concludes by summarizing the potential support problems for future NDI programs.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT [X] UNCLASSIFIED/UNLIMITED [ ] SAME AS REPORT [ ] DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Thomas H. Hoivik	22b. TELEPHONE *(Include Area code)* (408)-656-3301	22c. OFFICE SYMBOL AS/Ho

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete

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Unclassified

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An Analysis of Contractor Logisitical Support for Nondevelopmental Items

by

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Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT
(ADMINISTRATIVE SCIENCES)

from the

NAVAL POSTGRADUATE SCHOOL
March 1993

ABSTRACT

The purpose of this thesis is to analyze non traditional logistical support approaches for Nondevelopmental Items (NDI). NDI acquisition capitalizes on the use of commercial "state-of-the-art" technologies while providing DOD with effective and economical solutions to near term operational requirements. This thesis primarily focuses upon contractor logistical support strategies which are unique to NDI acquisition programs. Four current NDI programs were researched for logistical implications. These included: 1) the AN/ARN-148 Omega Navigational System, 2) the Secure Telephone Unit III, 3) the AN/PSS-12 Mine Detector, and 4) the AN/PSN-11 PLGR GPS Receiver. The NDI logistical support strategies identified and analyzed were: 1) No support required (discard system upon failure), 2) total contractor support, 3) organic support, and 4) a combination of organic and contractor support. The advantages and disadvantages of these support methods were analyzed. Potential logistical support strategies are identified that may enable U.S. Army program managers to maximize the benefits of using individualized and tailored support strategies for NDI acquisition. This thesis concludes by summarizing the potential support problems for future NDI programs.

C.1

TABLE OF CONTENTS

I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to analyze non traditional logistical support approaches for nondevelopmental item acquisitions. This thesis primarily focuses upon total contractor support strategies for nondevelopmental items since nondevelopmental item alternatives usually require a departure from traditional support methods. Alternative logistical support strategies will be identified and analyzed for several different major nondevelopmental item acquisitions. In addition, these acquisition strategies will be examined in order to identify potential support problems for future NDI acquisitions.

B. BACKGROUND

DOD Directive 5000.1, "Major and Non-Major Defense Acquisition Programs," states that acquisition strategies and programs shall be tailored to accomplish established program objectives and control risk. Prudent acquisition management dictates that new acquisition programs only be initiated after fully examining alternative ways of identifying military needs. All acquisition strategies must consider maximum use

of commercial and other Nondevelopmental Items (NDI) to meet military requirements [Ref. 1:p. 1-2].

The former (USD(A)), Mr Yockey, indicated that the reduced urgency for modernization and reduction in our Armed Forces mean that DOD will acquire fewer weapon systems in the future and the acquisition budget will be reduced accordingly. Also, DOD plans to broaden its access to the industrial base by shifting from military-unique products and processes to commercial counterparts as much as possible [Ref. 2:p. 2-8].

One initiative to stimulate efficiency and competition is streamlining weapons systems maintenance operations by allowing military maintenance depots and private firms to compete for maintenance work. Use of commercial items enables DOD to capitalize on economies of scale and achieve effectiveness in peacetime. Commercial capability enables defense downsizing to proceed more coherently. For example, commercial engine production is the foundation for automobile, truck, and tank engine manufacturing. It is not necessary to keep the tank engine industrial base in operation when efficient commercial processes exist [Ref. 2:p. 2-8].

Commercial NDI capabilities also create opportunities for DOD to quickly introduce technological breakthroughs in the form of high-quality, high-performance, low-cost, off-the-shelf equipment to satisfy military requirements [Ref. 3:p. 4]. As these off-the-shelf commercial items are introduced to the forces, they will require logistical support and possibly

support facilities. The DOD has recognized the need for innovative and cost-effective commercial alternatives to offset the high cost of developing unique military systems. A nondevelopmental item acquisition represents a new pathway and philosophical shift in the requirements process and materiel development [Ref. 4:p. 1-1].

Commercial suppliers and Government support facilities have key roles in equipping the military. Government depots (and arsenals) capabilities that are militarily unique play a key role in sustaining our military forces. Private contractors perform work across broader spectrums and promise efficiencies in a competitive environment [Ref. 5:p. 15-16]. Therefore, the intent of the NDI alternative is to provide DOD with effective and economical solutions to its essential operational requirements [Ref. 6:p. 2].

C. OBJECTIVE

The objective of this research is to examine the feasibility of using contractor support to reduce costly supportability problems. This study is conceptual in nature. The goal of this study was not to develop a generic Integrated Logistics Support Model for nondevelopmental item support strategies, but rather to explore the potential benefits and uses of a flexible support strategy. This research will identify possible logistical support strategies that may enable U.S. Army Program Managers to maximize the benefits of

using individualized and tailored support strategies for nondevelopmental acquisition.

D. RESEARCH QUESTIONS

1. Primary Research Question

Should the Department of Defense (DOD) utilize total contractor support for Nondevelopmental Item acquisitions?

2. Subsidiary Research Questions

a. What is nondevelopmental item acquisition?

b. What are the most commonly used logistical support strategies in nondevelopmental item acquisition?

c. What logistical support requirements are considered in the design of nondevelopmental item acquisition support systems?

d. How does the anticipated operational environment affect the logistical support strategy?

e. Are Integrated Logistical Support Plans aligned to the NDI acquisition strategy selected?

E. SCOPE OF THESIS

The research will determine the feasibility of using contractor support in order to reduce costly supportability problems. This study is intended to identify the best uses of total contractor support for nondevelopmental acquisitions. The study will not develop a generic Integrated Logistics Support model for nondevelopmental item support strategies, but rather examine the potential benefits and uses of a flexible and individualized support strategy. These

nondevelopmental items were selected based upon life-cycle costs and the support strategy selected: total contractor support, contractor/organic support, or organic support.

F. RESEARCH METHODOLOGY

The research methodology consists of an archival-based method. The information used for this research came mostly from available literature on system acquisition, nondevelopmental acquisition, and logistical support. Primary sources included DOD official documents and personal/telephone interviews with a small but representative sampling of program managers and logisticians for their personal insight on nondevelopmental acquisition strategies. Secondary sources included publications or materials gathered by other investigators. The literature review included current acquisition directives and instructions (specifically DOD instructions 5000.1 and 5000.2 of 23 February 1991) and military studies on acquisition, NDIs, and private industries.

G. ABBREVIATIONS

Appendix A is a list of acronyms used in this thesis.

II. THEORETICAL FRAMEWORK

A. INTRODUCTION

Chapter II provides the general background and theoretical framework for discussing nondevelopmental acquisition and logistical support implications for this study. This chapter explores the following areas: an overview for the acquisition process, the implications of nondevelopmental acquisition for the acquisition process, and some of the advantages and disadvantages of Nondevelopmental Item (NDI) procurement compared to a "traditional or classical" acquisition procurement.

B. ACQUISITION PLANNING PROCESS

This section will discuss the acquisition process and how nondevelopmental item acquisition differs from a traditional research and developmental acquisition.

"The purpose of the acquisition process is simple. It is to develop, produce, supply, and support weapons systems in order to achieve the operational goals of the Armed Services" [Ref. 7:p. 4]. In other words, the output of the acquisition process is to provide a materiel solution or service to support these operational goals or needs.

It is important to understand how acquisition policies influence the acquisition process. The President, Congress,

and DOD work to develop and establish National Security objectives, goals, and policies for the Armed Services. Once these National Security policies are formed, they are incorporated into acquisition policies. Basic guidance for acquisition programs comes from the President's Office of Management and Budget (OMB) which provides program guidance though Circular A-109, "Major Systems Acquisitions," dated 5 April, 1976.

There are other influences that affect acquisition policies also. Sometimes the results from special studies can affect acquisition policies. For example, Circular A-109 reflected many of the recommendations of the 1972 Commission on Government Procurement. The Commission recommended that the Executive branch of Government provide a standard organization policy, to include DOD, and emphasized the need for a shift in fundamental policy toward commercial product acquisition [Ref. 4:p. 1-1].

Today, this guidance is reflected in DOD directives. DOD Directives 5000.1, "Major and Non-Major Defense Acquisition Programs," and DODD 5000.2, "Defense Acquisition Program Procedures," establish general policies and procedures for managing major and non-major defense acquisition programs. These documents expand Circular A-109 and are designed to provide a single, uniform system for planning, designing, developing, procuring, maintaining and deposing of all equipment, facilities and services for DOD [Ref. 7:p. 5].

These policies help forge a closer, more effective interface among DOD's two major decisionmaking support systems affecting acquisition:

- Requirements Generation System.
- Acquisition Management System.

These characteristics and relationships define the integrated management framework for defense acquisition. Elements of the decisionmaking systems are adjusted as necessary to assist the Secretary of Defense in decisionmaking as circumstances change.

1. Requirements Generation

When the acquisition process identifies a need for a new hardware system, the acquisition process begins with the necessary requirements documents [Ref. 7:p. 21]. Once a need is identified that requires a materiel solution, nondevelopmental item acquisitions are one of the first strategies considered.

Acquisition programs can begin in a number of different ways. For example:

- Replacement for an existing system that has become obsolete.
- A new threat is identified that requires a new system design to counter that threat.
- DOD's missions change which requires new equipment.
- New technology is inserted into existing programs or sparks the development of new systems.

a. Mission Area Analysis

The acquisition process begins with a Mission Area Analysis (MAA) which is conducted by the service component. The Mission Area Analysis is a continuing process that identifies the perceived threat, technology changes, and inputs from operational personnel that may indicate a modification to existing equipment or development of a new system. This analysis may indicate the service component (also known as the user) has a deficiency or need that requires a military doctrine change or a materiel solution. If a doctrine change is not the solution, then a materiel solution is considered. The Mission Area Analysis comes into play again because a market surveillance is conducted as part of the MAA. The commercial market is reviewed for technology and systems that may fulfill operational requirements. Thus, market surveillance helps DOD avoid some of the costs associated with research and development efforts if commercial products and services can be purchased directly from industry [Ref. 7:p. 6].

b. Mission Need Statement

The Mission Need Statement (MNS) follows the MAA and is developed by the service component. Mission needs are identified as a direct result of continuing assessments of current and projected capabilities relating to military threats and national defense policy. Figure 1 shows the

evolution of these requirements though the acquisition process.

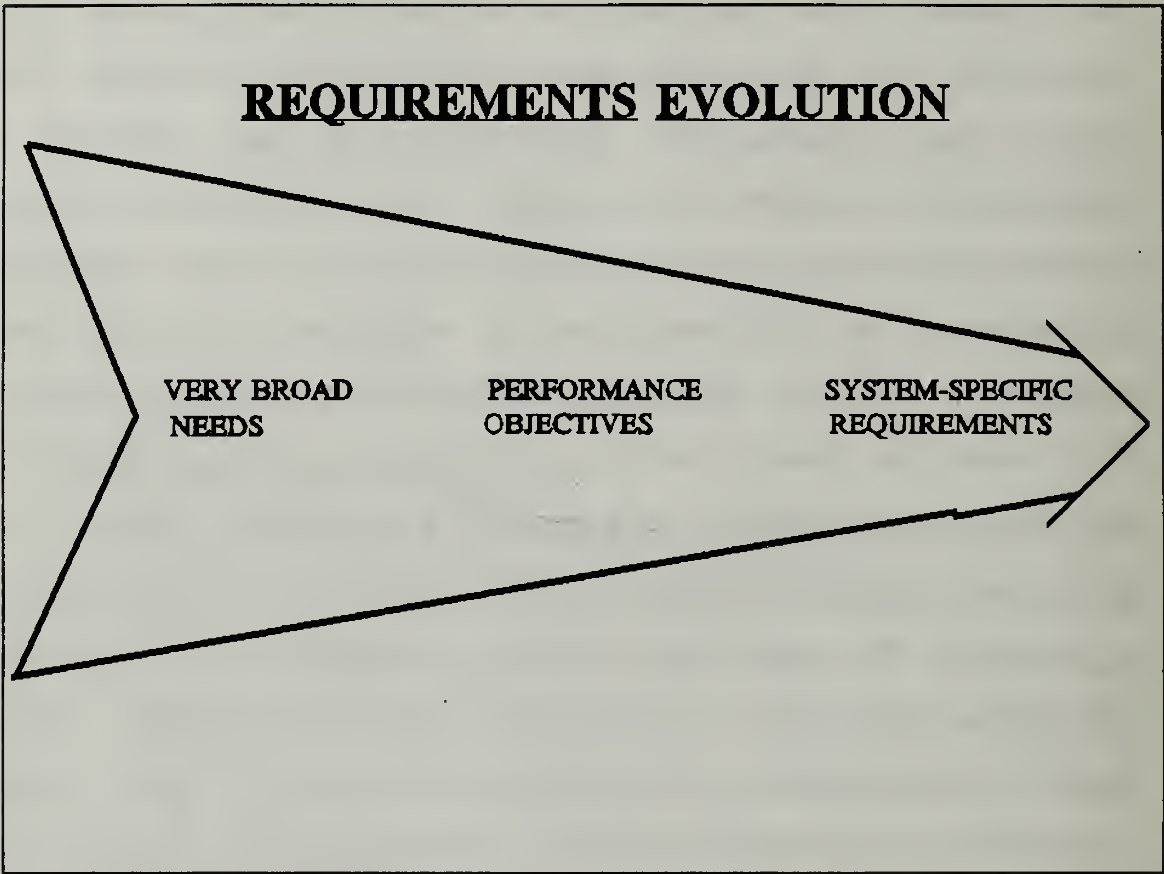

Figure 1 Requirements Evolution, Source [REF: 1:p. 2-2]

The Mission Need Statement defines projected needs in broad operational terms, e.g., "The need to impede the advance of large armored formations 200 kilometers beyond the front lines" [Ref. 1:p. 2-3]. The intention of the MNS is not to advocate a particular solution alternative, but to identify a need that requires some solution. These broad statements are continually refined as they progress though acquisition

process and become more detailed as they pass through successive decision points. Figure 2 depicts how Mission Need Statements are processed.

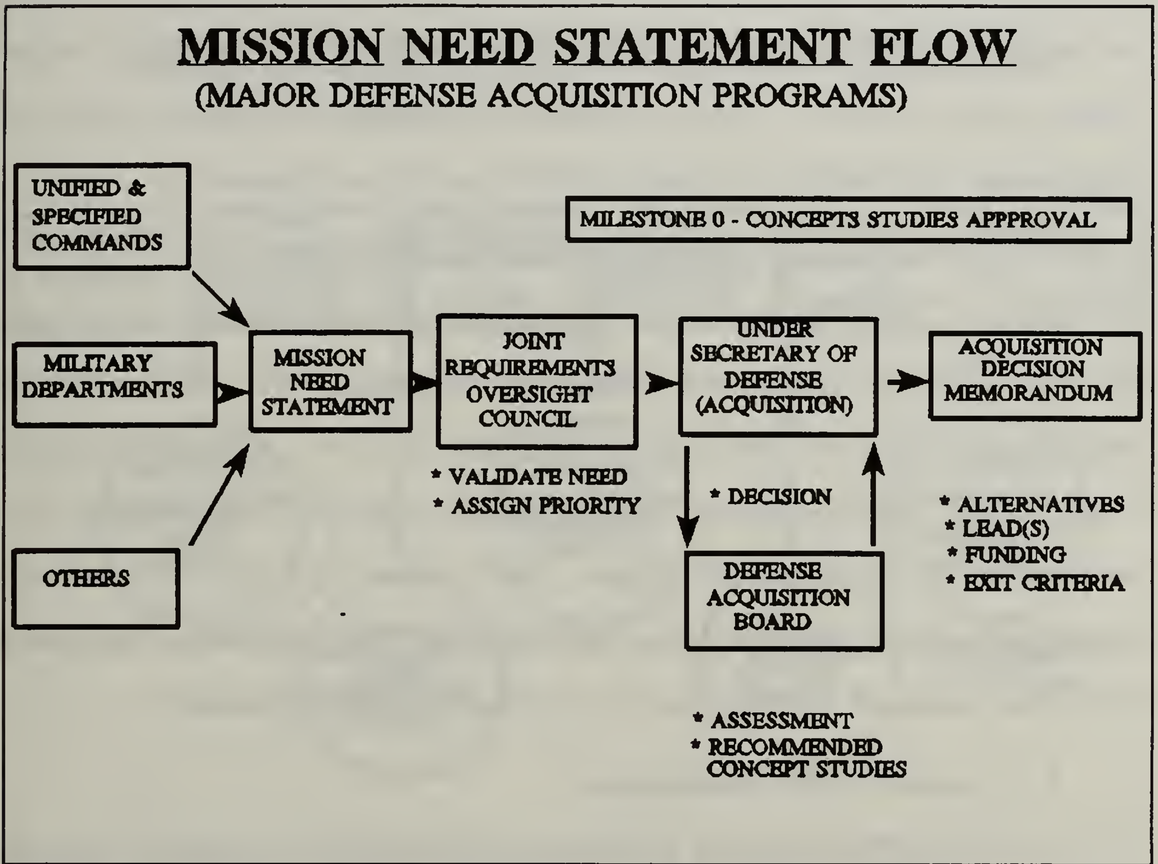

Figure 2 Mission Need Statement Flow, Source [Ref: 1:p. 2-4]

These statements are forwarded through established review channels to the Joint Requirements Oversight Council which is chaired by the Vice Chairman of the Joint Chiefs of Staff. The Council reviews each Mission Need Statement to determine if a materiel solution is necessary. If a MNS is

confirmed by the Council, it is forwarded to the Under Secretary of Defense For Acquisition (USD(A)) for approval. Next, the (USD(A)) may send the MNS to the Defense Acquisition Review Board (a Joint member board) for further evaluation. The Defense Acquisition Review Board may recommend proposed solutions for further study at a Milestone 0 decision review [Ref. 1:p. 2-5]. (The milestone decision process will be explained in further detail later in this chapter.)

c. Operational Requirements Document

The Operational Requirements Document is developed by the service component after the Mission Need Statement is approved. The objective of the ORD is to identify minimum acceptable performance requirements which help shape the acquisition program baseline [Ref. 8:p. 4-B-1]. Like the Mission Need Statement, the Operational Requirements Document will be updated throughout the acquisition process.

2. Acquisition Management

The interaction between requirements generation and acquisition management continues through structured logical phases separated by major decision points, called milestones [Ref. 1:p. 1-2]. This management system provides a streamlined management structure that is an event-driven acquisition process linking milestone decisions to demonstrated accomplishments [Ref. 1:p. 2-6]. This interaction continues through subsequent phases and milestones

and can span several years for a classical acquisition program [Ref. 1:p. 2-7]. Figure 3 depicts the acquisition phases and milestones.

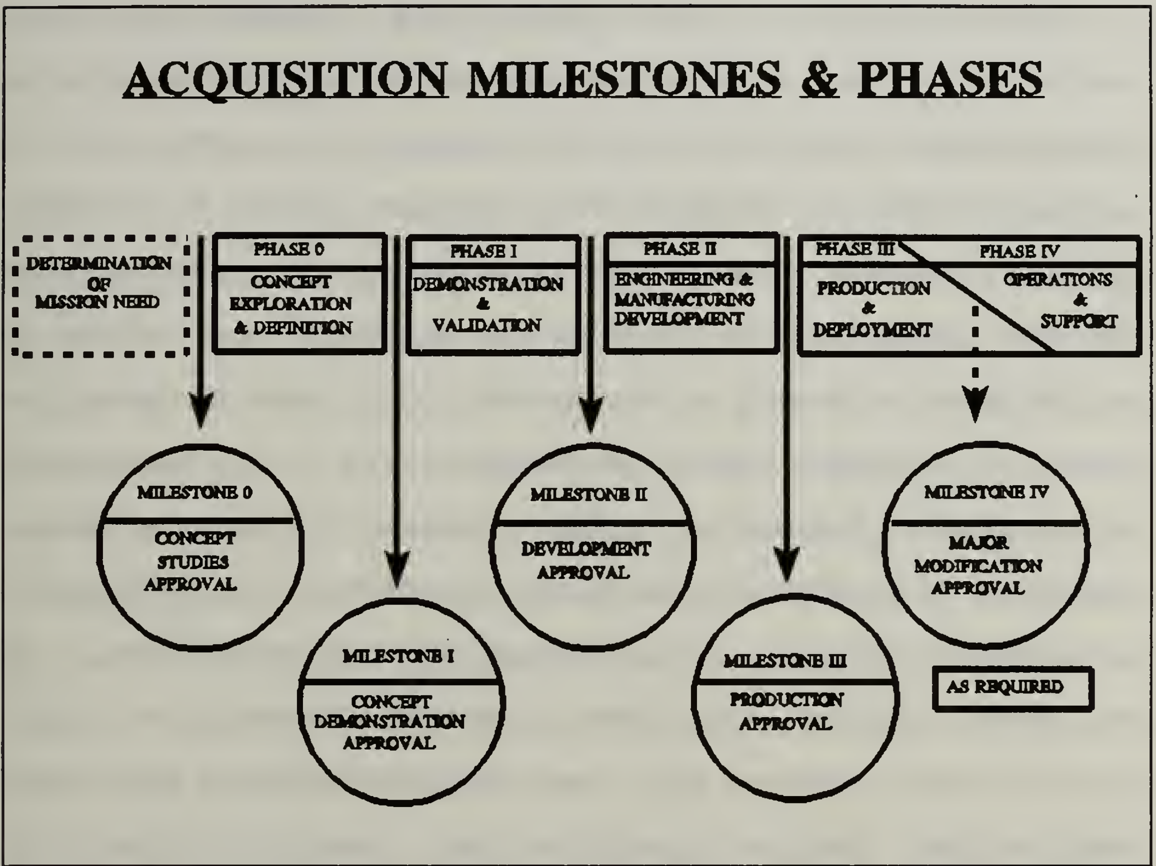

Figure 3 Acquisition Milestones and Phases, Source [Ref 1:p. 2-1]

The acquisition phases provide a logical means to progressively translate broadly stated mission needs into well-defined system-specific requirements. The focus of these activities is oriented and tailored to the establishment of the minimum required accomplishments, program-specific exit

criteria, and program objectives: "The acquisition strategy shall be tailored to meet specific needs of individual programs consistent with the policies established in DOD Directive 5000.1" [Ref. 8:p.5-A-1].

At Milestone 0, the Mission Need Statement has been approved to start a new program, signifying the beginning of the Concept Exploration/Definition Phase (CE/D). Normally the service component establishes a program office to develop, produce, deploy, and support the new system. The Program Manager (PM) selects alternative concepts and writes an acquisition strategy to be pursued based upon Mission Area Analysis, Mission Need Statement, and the Operational Requirements Document. The program office evaluates alternative concepts as to their potential life cycle cost, development schedules, and performance characteristics. The PM then selects the best concepts based upon their feasibility, technical risk, and cost tradeoffs for additional studies [Ref. 7:p. 11]. At this time, the PM should begin to consider nondevelopmental alternatives.

A favorable decision at Milestone I, Concept Demonstration Approval, marks the establishment of a new program Concept Baseline. The Concept Baseline includes minimum performance criteria outlined in the Operational Requirements Document and includes cost and supportability constraints. Milestone I approval allows the program to proceed to Phase I, Demonstration and Validation (DEM/VAL).

Some of the objectives of DEM/VAL are to define critical design characteristics and to demonstrate critical processes and technologies before proceeding into the next program phase. It is during this phase that prototypes are usually built and tested. A prototype is an original or model on which a later item is formed or based.

The program proceeds to Milestone II, Developmental Approval, once the Phase I exit criteria are met. Milestone II establishes a Developmental Baseline. The Developmental Baseline is a refinement of the Concept Baseline that it now replaces. Program cost, schedule, and performance objectives are approved for continuation into the next phase. Also, Low-Rate Initial Production (LRIP) quantities are identified, if applicable. LRIP is a limited production quantity designed to establish an initial production base and to permit an orderly increase in the production rate sufficient to lead to full-rate production later [Ref. 9:p. B-11]. LRIP is also a good tool to measure the logistical support system before going into full-rate production.

Upon successful completion of Milestone II, the program inters the third phase, Phase II, Engineering and Manufacturing Development (EMD). In this phase, the system/equipment and the principle items necessary for its support are fully developed, engineered, designed, and fabricated. EMD translates the most promising design approach into a stable, producible, cost effective system design.

Manufacturing and production processes are demonstrated and validated through a test and evaluation system [Ref. 8:p. 3-21]. A program may inter Milestone III, Production and Development, if the performance objectives are validated with satisfactory test results and LRIP provides reasonable assurance that the design is stable and capable of being produced. A Production Baseline is established before proceeding to the forth acquisition phase, Phase III, Production and Development.

Phase III objectives are to establish an efficient production and support base. The program should achieve an operational capability that satisfies the mission need at this point. Follow-on operational and production verification testing are conducted to verify quality and to correct any deficiencies [Ref. 8:p. 3-27].

Once the system is fielded, modifications may be required because the threat changes, a deficiency is identified, or a need to reduce operational costs. Approval of Milestone IV, Major Modification Approval, means that a major modification or system upgrade is approved for a system that is still being produced. Now the program can enter the fifth phase, Phase IV, Operations and Support. The objectives of this phase are to support the fielded system, monitor system performance, identify improvement opportunities, and modify the system as required. The system remains in this phase until system disposal is approved.

C. NONDEVELOPMENTAL ITEM ACQUISITION

1. General

Nondevelopmental item is a generic term that covers materiel available from a wide variety of sources with little or no development effort required by the Government [Ref. 4: p. 1-3]. A simple definition of "Nondevelopmental Item" is any item or equipment in which the user did not participate in its development,"[Ref. 7: p.20]. Nondevelopmental items are those items already developed and are capable of fulfilling requirements "as is" or with some "minor modification."

Title 10 (Section 2325) of the United States Code describes the meaning of nondevelopmental item (Appendix B). This statute includes any item in the commercial marketplace. In addition, any existing item already developed by the Services or other Government Agencies is considered an NDI. Systems developed with foreign governments and the United States are also considered nondevelopmental items.

The Army segregates nondevelopmental items into three categories:

- Category A. Off-the-shelf items used in the environment for which the items were designed with little or no development required.

- Category B. Off-the-shelf items used in an environment different from which the items were designed.

- Category C. Integration of existing components and essential engineering effort to accomplish systems integration with research and development to integrate the systems [Ref. 7:p. 8].

NDIs are acquired primarily since they eliminate the need for costly, time-consuming, development programs. Nondevelopmental item acquisitions have lower life cycle costs because NDIs can usually skip most of the research and development phases of the acquisition process. Therefore, the NDI acquisition process is shorter than the classical acquisition approach because most or all of the research and development phases are eliminated. In addition, legislation is advocating the use of NDI acquisition alternatives. Title 10 (Section 2325) mandates the "preferential" use of nondevelopmental items to satisfy requirements to the maximum extent possible (Appendix B).

NDI acquisition covers a spectrum of materiel alternatives since rapidly changing commercial technologies expand the potential for high quality and low cost commercial items to satisfy military requirements [Ref. 3:p. 4]. The electronics and personal computer markets are good examples of how high-tech and high quality items can be introduced and upgraded within a very short time. These commercial industries are able to introduce new technology rapidly because they have developed their own independent research and development capabilities.

These NDI markets provide opportunities for the Government to reduce research and development costs since these commercial industries are conducting their own research

and development programs. These concepts are used in other markets as well. Therefore, NDI acquisitions offer many possible solutions to materiel needs because of this broad resource base.

2. Nondevelopmental Item Preference

Nondevelopmental item acquisition challenges the traditional practice and cultural mindset of buying and developing only military unique items. NDI acquisitions allow for greater flexibility and lower life cycle costs in the procurement process [Ref. 10:p. 14]. The Department of Defense can no longer afford to restrict the acquisition process to military unique developmental efforts. Likewise, NDI acquisition will not always be the optimum solution to DOD's materiel needs. However, when NDI is the choice, DOD is afforded the opportunity to tailor its needs, such as, tailoring the logistical support structure for each NDI acquisition. Nondevelopmental item acquisition, as a concept, correlates to the movement of "commerciality" in the DOD acquisition environment because NDI has opened the door to a wide range of commercial alternatives to best meet the Government's needs [Ref. 7:p. 15].

The Commission on Government Procurement emphasized the need for a shift toward commercial product acquisition in 1972. IN 1976, the Office of Federal Procurement Policy directed Government Agencies to purchase commercial products

if they adequately satisfied the Government's needs. This fundamental shift toward commercial products continued when the President's Blue Ribbon Commission on Defense Management (Packard Commission) recommended that the Government make greater use of commercial components, systems, and services available "off-the-shelf" in 1986 [Ref. 10:p. 9].

The 1987 Preference Act also reinforced a preference for nondevelopmental items and required the DOD to state material requirements in terms of functions to be preformed, performance required, and essential physical characteristics [Ref. 4:p. 1-2]. The intention of this legislation was to insure that NDI alternatives are given consideration as solutions to materiel needs.

The Committee on Government Affairs stressed the need for DOD to expand the use of commercially available products and minimize research and development costs in 1989:

> Too often, the Department of Defense continues to subject commercially available parts to complex military specifications and, as such, requires contractors to reinvent a unique military specification wheel when a commercially available wheel can preform the task just as well [Ref. 11: p.1].

The 1991 Defense Authorization Act required DOD to conduct market research prior to developing new specifications to determine if nondevelopmental items are available to identified needs. This measure was implemented to stimulate the use of nondevelopmental item alternatives instead of developing a unique military product [Ref. 10:p. 10].

3. Classical Acquisition Versus NDI Acquisition

On average, an NDI acquisition cycle takes two and one-half to five years, while classical research and development cycles take eight to sixteen years, as depicted in Figure 4 [Ref. 7:p. 7]. NDI acquisition saves time in the acquisition process because the Demonstration and Validation and Engineering and Manufacturing phases can be combined or eliminated. A four to nine year cycle can be compressed into a one to two year "Proof-Of-Principle (POP)" phase [Ref 7:p. 24].

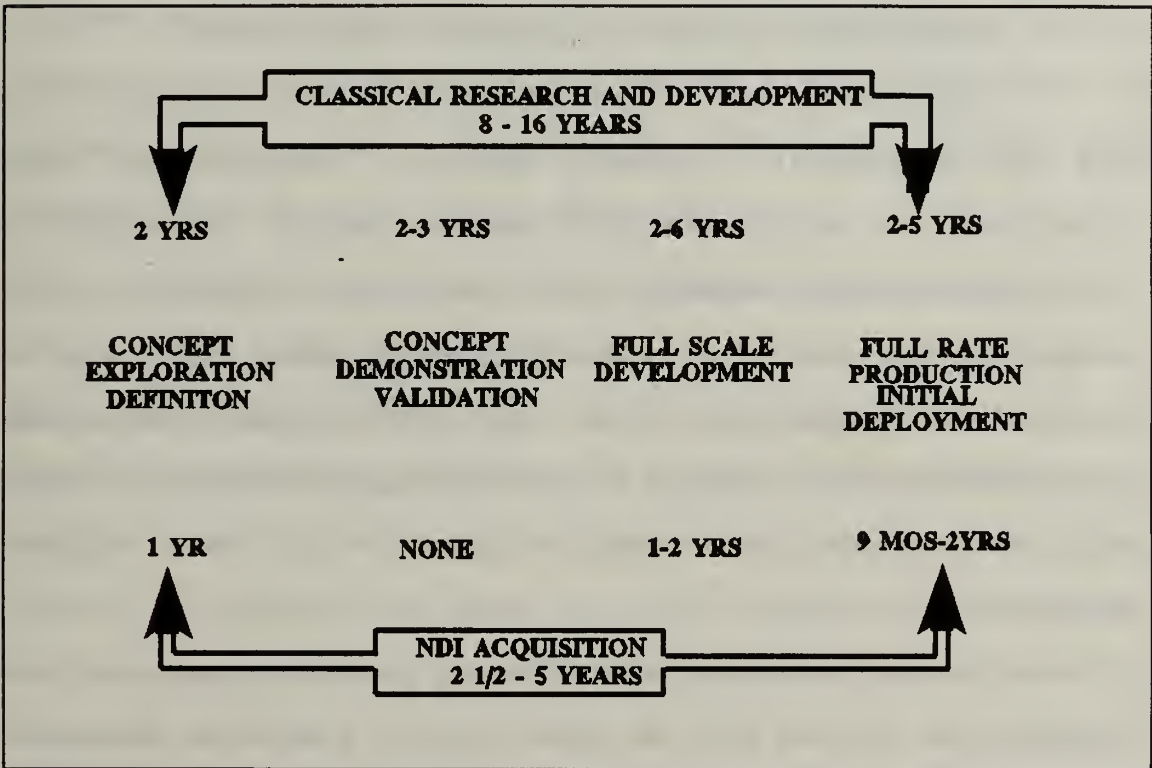

Figure 4 Acquisition Life Cycle Model, Source [Ref. 7:p. 25]

The second phase (DEM/VAL) of the acquisition process can be skipped because the commercial developer has usually conducted design, research and development, integration, logistical support, and test and evaluation efforts. Time in phase three (EMD) may be reduced even if some item modification is required to meet a military requirement. In this case, the developer must only demonstrate the capabilities of the NDI modification. Thus scheduling, testing, and production are more certain than under a classical acquisition program [Ref. 7:p. 25].

4. Advantages of Nondevelopmental Acquisition

Nondevelopmental item acquisition capitalizes on the use of commercial "state-of-the-art" technologies while providing DOD with effective and economical solutions to operational requirements. NDI acquisitions offer quick responses to operational needs because they have shorter acquisition cycles [Ref. 10:P. 12]. Testing requirements may be reduced because some of the commercial manufacturer's test and performance data can be used to prove military suitability.

Another advantage for using nondevelopmental item acquisition is that NDI has shown quality trends to be as good if not better than specially developed items when they are purchased to meet a military requirement [Ref. 12:p. 5].

NDI acquisitions tend to have lower life cycle costs because of the limited R&D costs, use of commercial specifications, and competition in the commercial market. Many studies have shown that competitive pressures lead directly to lower system prices. Additionally, NDIs are uniquely structured to take advantage of the competitive forces in the market place because the Government becomes another buyer in a market with many suppliers [Ref. 7:p. 23].

Many PMs prefer nondevelopmental items because they are able to project funding requirements more accurately when nondevelopmental items are part of the acquisition strategy. Theoretically, off-the-shelf prices are firm. Therefore, the program manager may project a schedule and a budget with minimum risk of being wrong [Ref. 7:p. 24].

5. Disadvantages of Nondevelopmental Acquisition

Each nondevelopmental item acquisition must have an individual support strategy and be incorporated into the acquisition strategy early on. Acquisition planning must ensure that logistics and support concerns are satisfied before a decision is made to buy commercial products. Nondevelopmental item acquisition is not without potential problems and risk.

Some major problems concern configuration control and obsolescence. These problems can be associated with rapidly changing technologies like electronic items. New products can

be introduced and discontinued in a short time. Therefore, NDI product configuration information often lags behind or falls victim to obsolescence which makes management of configuration integration difficult [Ref. 13:p. 5].

Sustainability problems can arise if repair parts and replacement items are not compatible with existing systems or support systems. If repair parts and replacement items are not interchangeable, additional spares and replacement parts will have to be introduced into the support system.

Inadequate market research may result in the failure of the product to meet performance or logistical support requirements. The market survey identifies a material alternative that is "good enough," not necessarily the best product [Ref. 14:p. 10]. As more and larger modifications are required, the intended benefits may rapidly disappear and the cost savings are lost [Ref. 12:p. 4].

Design stability is a another concern because much of the research and development effort is conducted by the commercial developer. As discussed earlier, many high-tech electronic products can be introduced into the marketplace very rapidly. Test and evaluation of the design could be incomplete because of the pressures to get the product into the market before a competitor does.

6. Examples of Nondevelopmental Items

There are a number of examples of nondevelopmental item acquisitions. Figure 5 depicts how NDI cost and schedule benefits diminish as the degree of modification increases. The simplest NDI starts with off-the-shelf items and increases in complexity to full scale development. The Army's Beretta 9mm pistol is an example of an "off-the-shelf" item. The Air Force's KC-10 aircraft is an example of a "ruggedization item." A ruggedized or militarized item is usually operated in an environment different than its original design. The Army's Mobile Subscriber Equipment (MSE) is an example of subsystem and component integration. The Army's Forward Area Air Defense System (FAADS) Avenger is an example of development with NDI piece parts [Ref. 10:p. 11]. The PATRIOT air defense missile system is an example of a classical or full development program.

The predominant use of nondevelopmental items is related to the insertion of an NDI subsystem, component, and piece part levels in major developmental efforts [Ref. 4:p. 2-3]. There are many commercial market areas that are well suited for nondevelopmental item acquisitions: computers, power generation, test measurement equipment, transportation and communications equipment, and navigational equipment [Ref 3:p. 15].

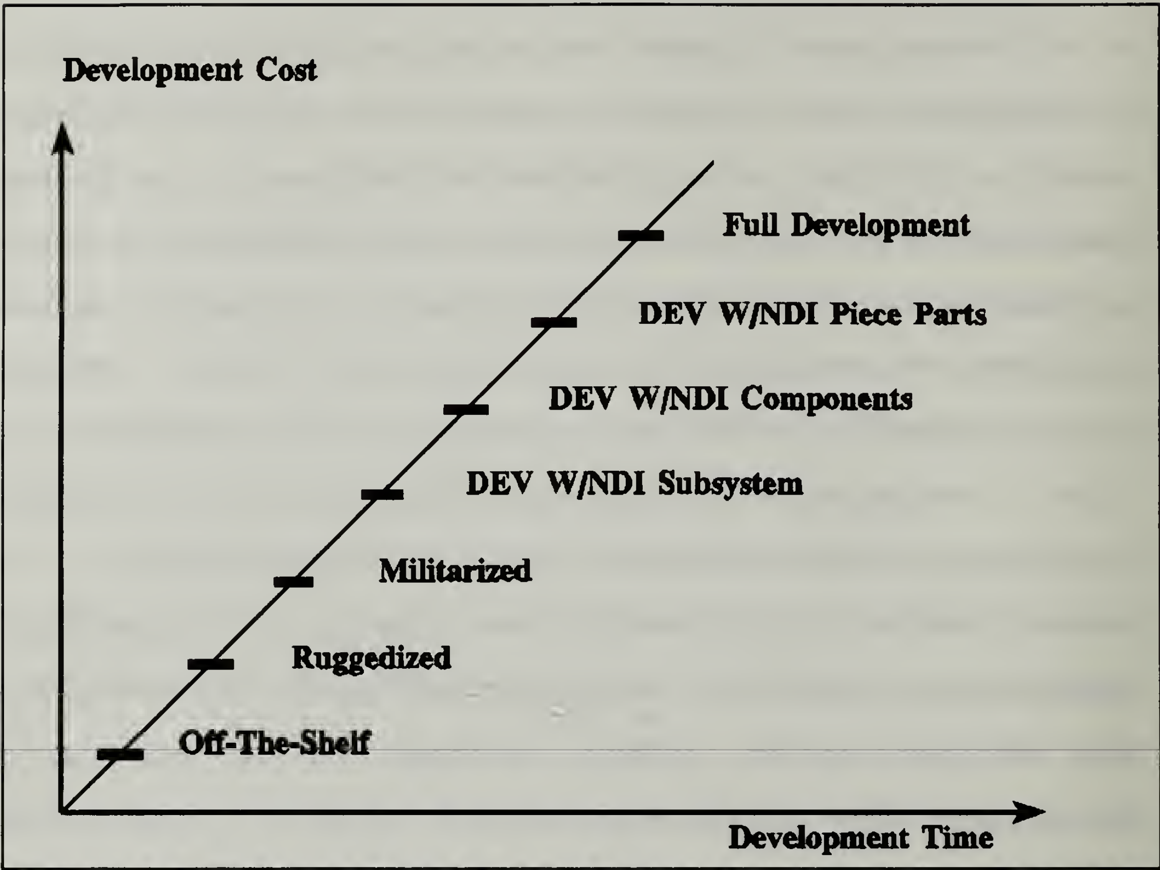

Figure 5 Development and Time Costs, Source [Ref. 10:p. 126]

D. CHAPTER SUMMARY

This chapter discussed the differences between classical acquisition and NDI acquisition strategies. Classical research and development programs take much longer than NDI programs to field. NDI programs are fielded much faster because most of the development phases are eliminated. Thus, testing and production can begin much sooner. In addition,

NDI programs are less expensive because development costs are saved. Chapter III will discuss NDI support methods.

III. NDI LOGISTICAL SUPPORT REQUIREMENTS

A. INTRODUCTION

Chapter II described the theoretical framework for the acquisition of nondevelopmental items. This chapter explores the potential benefits of using Nondevelopmental Item (NDI) Acquisition and addresses special support considerations for nondevelopmental systems.

It is important to understand the NDI support methods and how they are applied. The entire process of planning and acquiring logistical support must be tailored to the constraints inherent in the nondevelopmental item being supported. The Logistical Support Analysis is an important tool that can used identify support requirements and constraints of a system. This analysis helps design the Integrated Logistical Support Plan that is the Government's formal logistic support planning document for a program. Much of a program's success in the operational phase is dependent upon the quality of the support analysis and support planning. Too often, inadequate support plans cause increased operating costs.

B. INTEGRATED LOGISTICAL SUPPORT (ILS)

According to DOD Directive 5000.39, "Acquisition and Support Management of Integrated Logistical Support for Systems and Equipment," Integrated Logistical Support is a disciplined, unified, and iterative approach to the management and technical activities necessary to:

- Integrate support considerations into system and equipment design.
- Develop support requirements that are related consistently to readiness objectives, to design, and to each other.
- Acquire the required support.
- Provide the required support during the operational phase at minimum cost [Ref. 9:p. 1-1].

The Program Manager is assigned the responsibility to establish and manage an adequately funded ILS program. ILS policy emphasizes readiness (a system's capability to perform its wartime mission) implications early during system development. Therefore, the early identification of readiness and supportability design parameters is necessary to achieve system readiness objectives at an affordable cost [Ref. 9:p. 1-1].

The ILS program will address the impact of support costs upon the total system cost, known as the Life Cycle Cost (LCC). LCC includes research and development costs, production and construction costs, operational and maintenance costs, system retirement and phase out costs. All these factors influence the maintenance concept and logistical

support for the system. The concept chosen to meet the operational requirement locks in approximately 70 percent of a system's LCC during the operational phase [Ref. 9:p. 6-4]. NDI programs are constrained because they do not have any input into system design. The commercial developer's decisions during the design process may restrict the program's support options.

C. INTEGRATED LOGISTICAL SUPPORT PLAN (ILSP)

"The 'Acquisition Strategy' is the program manager's plan for satisfying the user's need," [Ref. 7:p. 13]. The acquisition strategy must make effective use of available financial, technological, and commercial resources. NDI support factors include the maintenance concept for the entire system that capitalizes on existing facilities and equipment and incentives for commercial repair to minimize cost if applicable.

The Integrated Logistical Support Plan (ILSP) is a key factor in successfully fielding and supporting a system [Ref. 7:p. 14]. The ILSP covers all the logistic activities for the life of the system. The Integrated Logistical Support Plan should provide for a smooth transition of support responsibility from contractor to organic support, if applicable [Ref. 8:p. 7-A-2-4]. The parameters used in determining support resource requirements are traceable to program objectives and thresholds presented in the acquisition

strategy [Ref. 8:p. 7-A-2-3]. Therefore, the ILSP should reflect the NDI's support strategy.

D. LOGISTICAL SUPPORT STRATEGIES FOR NDI

There are four methods that can be used to provide logistical support for nondevelopmental items:

- No support required.
- Total contractor support.
- Organic support.
- A combination of organic and contractor support.

The decision regarding the support method should be made as early as possible in the life of the program so that the contracts may be structured to facilitate the required system support [Ref. 7:p. 40]. The support methods and their advantages and disadvantages are presented below.

1. No Support (NS)

This support method works by not repairing equipment regardless of the type of failure. Instead, the item is replaced with a spare when it fails. Items designated to receive this method of support are called "non-repairable items" [Ref. 7:p. 40]. Choosing this support method implies that the cost of spare units and disposal is cheaper than repairing the system to a ready for use condition [Ref. 9:p. 16-2]. Also, the components used to make the system are

usually low cost items which justifies disposal (when they fail).

A non-repairable system is normally modular in construction with easily removable sub-components. Fault detection and isolation of failed components should be easy because the user discards the system after it fails. Therefore, a self test capability is important. The self test should be thorough and confirm failures before discarding the system or this could be expensive [Ref. 7: p. 40].

a. Advantages

The no support method offers some advantages because this method requires minimal logistical support. Lower level spare parts are not required because the entire unit is replaced. The only maintenance test equipment required is limited to initial system check-out and ready-for-use certification. In addition, there is no need for internal accessibility, test points, plug-in sub-assemblies, or maintainability enhancements. Therefore, low personnel maintenance skills are required because maintenance actions are limited to removal and replacement functions (for example, removal and replacement of an inexpensive circuit card).

b. Disadvantages

The decision to implement this support concept should consider its effects during conflicts and peacetime environments. If the system is not to be discarded upon

failure during wartime, other support concepts should be considered. It could be difficult to set up a different support system during a conflict. New items, new maintenance equipment, and maintenance training would be required to implement a new support system. To minimize these potential difficulties, a total discard upon failure system should be used in peacetime, as well as wartime [Ref. 7:p. 42].

There are also other areas of concern. Inventory stock levels for replacement spare units/systems must still be maintained for rapid replacement. Additionally, repair would be difficult because replacement parts are not stocked. Further, transportation time requirements could also affect the replenishment of inventory stock during times of high demand. Finally, if inventory replenishment lags behind inventory demand requirements, stockade levels will fall or zero out. This causes inadequacies in the support system, which could be critical in wartime environments.

2. Total Contractor Support (TCS)

Total Contractor Support involves establishing contractual responsibility for all system maintenance with a commercial contractor. The Government simply notifies the contractor if an item fails and the contractor is responsible for restoring the item to working order. Total contractor support is more applicable for systems operating in a non-combat environment because the repairs are normally conducted

at the contractor's facility far from combat locations [Ref. 9:p. 16-4].

There are some common characteristics with equipment that is best supported by total contractor support. TCS will work well for items that are too expensive to discard upon failure and when other support methods are not practicable (e.g., additional personnel required or too expensive to set up)[Ref. 7:p. 42]. Total contractor support may also be appropriate in systems where the relative frequency of failure is low.

a. Advantages

By using TCS, the contractor assumes the risk for any failures during the contract period. Other advantages are that the Government would not require tools and test equipment because the contractor provides ready-for-use certification and performs all repairs [Ref. 9:p. 16-3]. Inventory systems are reliable because spare units can be stored on site or at contractor facilities. Also, military maintenance personnel requirements can be reduced since the contractor does all the repair work.

> Contractor support may be the best option in high technology areas where maintaining state-of-the-art is critical, e.g., computers and associated software. The Air Force has found traditional methods of logistical support are not appropriate for their commercial computer systems. The proliferation and exponential growth of commercial computer systems in the Air Force demand support

techniques that are prompt and maintenance effective without being cost prohibitive. The Navy has experienced a similar change. [Ref. 7: p. 44].

b. *Disadvantages*

Total dependency upon the contractor means accepting possible risks in excessive maintenance costs, quality instability (internal design changes and substitute components), untimely and inadequate support (if too far from repair facilities), and system upgrades that may not be compatible with existing equipment [Ref. 7:p. 44]. If the system has a high failure rate, then the maintenance costs will increase because more repairs are required. Thus, the price for this type of support can be considerable. This support system is transportation intensive in order to replenish spare system inventories and repair/return systems to the users. Delays may be experienced in these areas because the contractor's repair facilities may not be located near the users' locations. The program manger must consider these impacts on these logistical areas when this support method is chosen [Ref. 15:p. 112].

3. Organic Support (OS)

Organic Support for a military organization implies that the organization has the internal resources in place and the required maintenance skills to operate their own support systems. The organization performs all maintenance tasks on the system. Normally, the organization identifies maintenance

problems, repairs/replaces systems, maintains spare parts and spare system inventories. Historically, the DOD has used organic support for most systems and equipment:

> Traditional logistics presupposes that organic support is the mandatory option. Again, this may be true for some systems and generally can be accomplished for all systems if cost is not a consideration. But realistically, DOD managers must recognize efficient and effective support depends upon their ability to influence system design and parts selection. Otherwise, we accept the risk of costly sole source parts supply, including maintenance manuals and testing equipment of costly acquisition, if available, of technical data and a system design freeze to a baseline with additional costs to maintain the production base [Ref. 7:p. 46].

Organic support is organized into three levels of maintenance: organizational, intermediate, and depot maintenance. Organizational level maintenance is conducted by the activity (organization) which actually uses the equipment, within the activity's capability. Maintenance is limited to equipment performance checks, external adjustments, and removal or replacement of some components. The least skilled personnel are assigned to these tasks.

Intermediate maintenance is performed by mobile, semi-mobile, and/or specialized organizations and installations. At this level, tasks may include repair of end items by removal or replacement of major assemblies, modules, or piece parts. Additional test and support equipment and more spares are required. Intermediate level maintenance personnel perform

more detailed maintenance tasks than organizational level personnel.

Depot maintenance is the highest level of maintenance because it supports the accomplishment of tasks above the capabilities of intermediate and organizational levels. The depot may be a specialized repair facility supporting many systems and may be the manufacturer's plant. These facilities are fixed installations and can handle bulky equipment and large numbers of spare parts. Depot level maintenance is capable of complete overhauling, rebuilding, and calibration of equipment [Ref. 15:p. 116].

a. *Advantages*

The initial investment for OS can be very large because the Government may need to build facilities and buy repair equipment. However, OS may be less expensive and more effective in the long run for NDIs. Organizational support has the infrastructure to support systems that have high failure rates and large populations [Ref. 7:p. 45]. Large volume inventory capabilities, repair skills and repair equipment, and military transportation assets enable OS to support these high demands regularly. Moreover, organic support is better suited for combat environments because maintenance operations and organizations are located near combat units. In addition, if a system is needed for some future application, the Government may choose to develop the

organic support capability. Some of the existing support capabilities and facilities could then be utilized, thereby, reducing the time required to develop a new support program.

b. Disadvantages

By using Organic Support, the Government develops the complete support program and solely bears the risk for system failure [Ref. 9:p. 16-4]. Additionally, the Government may need to obtain technical data for the system to design a logistical support system. This information determines the number of spare components and spare parts, and maintenance skill requirements [Ref. 9:p. 7-9]. This type of requirement would need sufficient operational or historical reliability and maintainability data to justify the initial investment. Another consideration is that the system has to be repairable or offer some salvage value. NDIs have a shorter acquisition cycle and therefore, usually require interim support before organic support methods can be designed and implemented [Ref. 7:p. 45].

4. Organic Contractor Mix (Mix)

The Organic and Contractor Mix support method combines elements of the two previously discussed methods. The Mix method involves the sharing of system failure between the Government and the contractor. Maintenance responsibilities may be shared in any manner that is beneficial to the Government. Usually the Government assumes the organizational

maintenance tasks and the contractor assumes the depot maintenance functions [Ref. 7:p. 47].

a. Advantages

The Mix support method is best suited for systems that do not fall into the non-repairable category and are not best served by total contractor support. This support method would be more applicable to long life cycle items not subject to rapid state-of-the-art technology changes [Ref. 7:p. 47].

A system requiring a phased support system could be considered for a Mix method. Phased support allows a program to design the support structure incrementally, according to the availability of maintenance assets. A program choosing organic support may require time develop the required support assets. Initial support would be provided by the contractor until the system transitions to organic support or to a Mix [Ref. 7:p. 48].

b. Disadvantages

A significant concern of using a Mix support concept is controlling the transition from a particular support method to another method. The requirements between the Government and the contractor (if used) must be clearly defined and understood by all parties. Misunderstandings could cause scheduling delays and increase costs.

E. LOGISTICAL SUPPORT ANALYSIS FOR NDIs

Logistical Support Analysis (LSA) is an iterative analytical process by which logistical support necessary for a new system is identified and evaluated. LSA is a part of the systems engineering process that ensures that system design and supportability requirements are integrated early in the system. As a design analysis tool, it is employed throughout the early phases of system development and often includes maintenance analysis. The quantitative methods of LSA have applications in the following areas:

- Initial determination and establishment of logistics criteria as an input to system design.
- Evaluation of design alternatives.
- Assessment identification and provisioning logistic support elements.
- Final assessment of system support capabilities.

An output of LSA is the identification and justification for logistic support resources: spare/repair part types and quantities, test and test support equipment, and personnel skill-level requirements. This output is called the Logistic Support Analysis Record (LSAR) [Ref. 15:p. 14]. The LSAR is a formal tool under MIL-STD 1388-2A to document operations and maintenance requirements. The LSAR is the basis for training, personnel, supply provisioning, support equipment acquisition, facility construction, and maintenance tasks.

The following logistical support elements should be considered in the Logistical Support Analysis for NDIs:

- Reliability.
- Availability.
- Maintainability.
- Standardization.
- System use.
- System environment.
- System operation.
- System maintenance level.
- System cost.

1. Reliability Analysis

Reliability is the probability that a system or product will perform in a satisfactory manner for a given time when used under the specified operating conditions. This definition stresses the elements of probability, satisfactory performance, time and specified operating conditions. These four elements are extremely important because each plays a significant role in deciding system/product reliability [Ref. 15:p. 14].

a. Probability

Probability is usually stated as a quantitative expression representing a fraction of a percent signifying the number of times that an event occurs (successes), divided by the total number of trials. For example, a statement that the probability of survival of an item for 80 hours is 0.75. (or 75 percent) indicates that we can expect that item will

function properly for at least 80 hours, 75 times out of 100 trials [Ref. 15:p .14].

When there are several supposedly identical items operating under similar conditions, it can be expected that failures will occur at different points in time. Thus, failures are described in probabilistic terms. The fundamental definition of reliability is heavily dependent upon the concepts derived from probability theory [Ref. 15:p. 15].

b. *Satisfactory Performance*

Satisfactory performance suggests that specific criteria must be established which describe what is considered satisfactory system operation. A combination of qualitative and quantitative factors defining the functions that the system is to accomplish, usually presented in the context of a system specification, are required [Ref. 15:p. 15].

c. *Mission Time*

Mission time is an important element since it represents a measure against which the degree of system performance can be related. One must know the "time" parameter in order to find the probability of completing a mission or a given function as scheduled. Of particular interest is being able to predict the probability of a system surviving (without failing) for a designated period. Also, reliability is frequently defined in terms of mean time

between failure (MTBF) and mean time between maintenance (MTBM) [Ref. 15:p. 15].

MTBF is a basic technical measure of reliability. MTBF is the total functional life of a population of an item divided by the total number of failures within the population, for a particular interval. This definition holds true for time, rounds, miles, events, or other measures of life units [Ref. 15:p. 18].

MTBM is the mean or average time between all maintenance actions (corrective and preventive). Corrective maintenance includes all unscheduled maintenance actions performed as the result of a system failure, to restore the system to a specified condition. These actions include failure identification, repair and replacement, checkouts, and condition verification. Preventive maintenance includes all scheduled maintenance actions performed to retain a system in a specified condition. Preventive actions include periodic inspections, critical item replacements, and calibration [Ref. 15:p. 18].

d. Specified Conditions

Specified conditions may include several environmental factors such as geographical location, operational profile, transportation profile, temperature cycles, and humidity. These factors must not only address the condition for the period when the system is operating, but

also the conditions when the system is in a storage mode or being transported from one location to the next. Experience has shown that the transportation, handling, and the storage modes are sometimes more critical from a reliability standpoint than the conditions experienced during the actual system operational use [Ref. 15:p. 15].

These four elements are critical in determining the reliability of an NDI system. System reliability is a key factor in the frequency of maintenance, and the maintenance frequency obviously has a significant impact on logistical support requirements. Reliability predictions and analyses are required as an input to the LSA. Reliability is an inherent characteristic of design. Recall, NDI does not have input into system design. As such, it is essential that reliability be addressed throughout the system life cycle [Ref. 15:p. 15].

2. Availability

Availability is often used as a measure of system readiness, i,e., the degree, percent, of probability that a system will be ready or available when required for use. It is the probability that the system is operating satisfactorily at any point in time when used under stated conditions, where the total time considered includes operating time, active repair time, administrative time, and logistics time. This is often called "operational readiness." [Ref. 15:p. 69].

Operational readiness affects the number of spares and spare parts required to reduce repair times. Therefore, the NDI support method must consider availability requirements.

3. Maintainability

Maintainability is an inherent characteristic of a system design, like reliability. Maintainability pertains to the ease, accuracy, safety, and economy in the performance of maintenance actions. A system should be designed such that it can be maintained without large investments of time, cost, or other resources (e.g., personnel, facilities, materials, test equipment) and without affecting the mission of that system. Maintainability is the ability of an item to be maintained, whereas maintenance constitutes a series of actions to be taken to restore or retain an item in effective operational state. Maintainability is a design parameter. Therefore, maintainability is a result of design [Ref. 15:p. 17]. The system determines the maintainability requirements, not the support method. Thus, an NDI program must analyze maintainability requirements before choosing a support method.

Maintainability can also be defined as a characteristic of design that can be expressed in terms of maintenance frequency factors, maintenance times, and maintenance cost or a combination of factors, such as:

- A characteristic of design installation which is expressed as a probability that an item will be retained in or restored to a specified condition within a given period, when maintenance is performed in accordance with prescribed procedures and resources.
- A characteristic of design and installation which is expressed as the probability that maintenance will not be required more than x times in a given period, when maintenance is performed in accordance with prescribed procedures and resources. This may be analogous to reliability when the latter deals with the overall frequency of maintenance.
- A characteristic of design and installation which is expressed as the probability a system is maintained in accordance with prescribed procedures [Ref. 15:p. 17].

Maintainability requires the consideration of many different factors involving all aspects of the system, and the measures of maintainability often include a combination of the these factors.

a. *Mean Time Between Maintenance (MTBM)*

MTBM is the mean or average time between all maintenance actions, corrective and preventive, which was discussed earlier. It includes consideration of reliability MTBF and Mean Time Between Repair (MTBR). The maintenance frequency factor, MTBM, is a major parameter in determining system availability and overall effectiveness [Ref. 15:p. 48].

b. *Mean Time Between Repair (MTBR)*

MTBR is a factor of MTBM, and refers to the mean time between item replacement and is a major parameter in deciding spare part requirements. A maintainability objective in system design is to maximize MTBR where feasible. Often,

corrective and preventive maintenance actions are accomplished without generating a requirement for replacement part. In other instances, item replacement is required, which necessitates the availability of a spare part and an NDI inventory requirement [Ref. 15:p. 49].

c. *Logistic Delay Time (LDT)*

LDT is the maintenance downtime expected as a result of waiting for spare parts to become available, waiting for the availability of test equipment required to perform maintenance, waiting for transportation, waiting to use a facility required for maintenance, and so on. LDT does not include active maintenance time. It is a major element of total maintenance downtime and could be significant for NDIs [Ref. 15:p. 48].

d. *Administrative Delay Time (ADT)*

ADT refers to that portion of downtime during which maintenance is delayed for reasons of an administrative nature: personnel assignment, labor strike, organizational constraint, etc. ADT does not include active maintenance time [Ref. 15:p. 49].

e. *Maintenance Downtime (MDT)*

Maintenance downtime is the total elapsed time required (when a system is not operational) to repair and restore a system to full operating status, and/or to retain a

system in that condition. MDT includes mean active maintenance time, LDT, and ADT [Ref. 15:p .47].

4. Standardization

The Government may purchase several different systems to meet the same needs of different organizations when relying upon the commercial market. For example, consider the purchase of an office typewriter. Many commercial firms manufacture typewriters. If a Government organization had a requirement for one, it would not develop it from a typical research and development approach. Instead, the organization would buy directly from the manufacturer to save unnecessary research and development costs. Unless the organization specified some level of compatibility with existing typewriters, they may end up buying a model that is not compatible with typewriters currently in use. This causes a logistical support problem because the agency would have to stock at least two different types of ribbons for the different typewriters [Ref. 15:p. 30].

Hardware and software proliferation is one area of NDI where systems must be compatible and interchangeable of readiness can be affected. Standardization of equipment should be an important consideration because of the impact upon spare part inventories. A Form, Fit, Function (F^3) analysis can be a valuable tool because requirements can be evaluated in functional terms, such as, speed, range, weight,

and other characteristics [Ref. 7:p. 30]. In addition, an F^3 analysis can enable NDIs to support multiple systems having the same or similar performance requirements. Therefore, standardization would be promoted and reduce the need for the logistical support system to carry several different groups of spare parts to support these items.

5. System Use

The degree of militarization affects the potential benefits of an NDI acquisition. As the military version differs more and more from the commercial version, the benefits of NDI diminish. Military modifications could mean an increase in system complexity and cost. Additional tests could be required which can also increase cost and delay the fielding schedule. As the degree of militarization increases, the need for an organic support system increases [Ref. 7:p. 33].

6. System Environment

The environment that the nondevelopmental item operates in is important. This factor can be divided into two categories: hostile and benign. If the NDI system is to be used in direct combat operations, a total contractor support system may be very difficult to implement. The contractor would be brought into a combat environment to provide service. However, contractor maintenance service is possible if systems can be moved from the battlefield to a more benign environment

[Ref. 7:p. 51]. A benign environment favors total contractor support. The cost of this service in a benign environment would not include the cost of training support personnel in combat techniques. However, combat training may be a part of the cost for organic support. The closer this environment is to the commercial environment, the more DOD can rely on commercial support as an option [Ref. 7:p. 33].

7. System Operating Cycle

Usually, long operating cycles for systems indicates a mission of a routine and ongoing nature. For systems that fall into this category, service cycles can be planned in advance, which makes total contractor support easier for all systems than with systems with short cycles. Short operating cycles usually suggest intermittent, randomly scheduled missions. In addition, these systems tend to spend a great deal to time in stand-by status. For these systems, support services cannot be conveniently scheduled in advance. Therefore, systems with short operating cycles are better served with an organic system [Ref. 7:p. 51].

8. System Maintenance Level

This factor describes the level of maintenance where most system repair will occur. A no support system is favored when most of the maintenance actions are expended at the organizational level. For repairable systems that require higher levels of maintenance, like intermediate or depot level

for repairs, some level of support is required. A mix support system may be preferred if the system is mostly repaired at the intermediate and depot levels. If most of the repairs were at the intermediate level, the Government would develop an organic intermediate level capability and contract the depot level maintenance [Ref. 7:p. 53].

9. System Cost

Two broad categories segregate life cycle costs. They are recurring and non-recurring costs. Recurring costs are those life cycle costs attributable to individual systems because each system has its own operational and support costs. In turn, each system procured increases the operational and support costs associated with that system. These costs and maintenance costs will affect the NDI support method [Ref. 15:p. 35].

F. CHAPTER SUMMARY

This chapter addressed the potential benefits of using nondevelopmental item acquisition and the support considerations for nondevelopmental systems. The support method selected must be tailored to the constraints inherent in the nondevelopmental item being supported. The Logistical Support Analysis is an important tool that can be used to identify NDI support requirements and constraints of a system. This analysis helps design the Integrated Logistical Support Plan for an NDI program.

IV. ANALYSIS OF CURRENT NDI PROGRAM SUPPORT STRATEGIES

A. INTRODUCTION

This chapter examines current support strategies of four Nondevelopmental Item/System (NDI) acquisitions. NDI logistical support strategies from several different major nondevelopmental item acquisitions were researched. Four nondevelopmental items were selected based upon life-cycle costs and the support strategy selected. The four NDI programs were: AN/ARN-148 Omega Navigational System, Secure Telephone Unit III, AN/PSS-12 Mine Detector, and the AN/PSN Precision GPS Receiver. Table 1 depicts the NDI programs researched.

Sources included DOD official documents and telephone interviews with a sampling of current U.S. Army Program Managers (PMs) and logisticians for their insight on nondevelopmental acquisition strategies. Program acquisition strategies and logistical support plans were analyzed to determine if they complement each other and the rationale behind selecting the support method chosen. Annex C lists the interview questions used to obtain field information for this study.

TABLE 1 PROGRAM PRODUCTION COSTS			
NDI PROGRAM	**# OF UNITS**	**UNIT COST**	**PRODUCTION COST**
AN/ARN-148 Omega Navigational System	359	$13,700	$8,297,590
Secure Telephone Unit III	60,000	$1,995	$119,700,000
AN/PSS-12 Mine Detector	29,487	$1,600	$45,994,000
AN/PSN-11 PLGR GPS Receiver	35,000	$4000-6000	$175,000,000

SOURCE: Developed By Researcher

B. BACKGROUND

As discussed earlier, NDI alternatives usually require a departure from traditional support methods. Each NDI acquisition should consider possible support strategies early in the planning process. Mission requirements heavily influence the type of logistics support required.

The service component also greatly influences the support concept decision. The Air Force, Navy, and Army may have different mission and support requirements for the same or similar nondevelopmental item. The entire process of planning for and acquiring logistical support must be tailored to the constraints inherent in the nondevelopmental item being

supported. Too often, an inadequate support plan caused increased operating costs. For example,

> The LOGMARS system in the NAVY expanded to the point that TCS [Total Contractor Support] was too expensive. By changing the support MIX of organic and contractor support and having the contractor charge for the repair on a per-incident basis, the NAVY reduced its annual budget for LOGMARS from $590,000 to $163,000 [Ref. 7:p. 44].

Recall, there are four basic ways to support a system: No Support (NS) required, Total Contractor Support (TCS), Contractor/Organic Support (MIX), and Organic Support (OS). Historically, the Department of Defense uses organic support for most systems and equipment. Regardless which support method is chosen, the advantages and disadvantages should not be overlooked.

C. ANALYSIS OF NDI PROGRAMS

The following NDI programs will be analyzed in these areas: acquisition strategy, support strategy, advantages and disadvantages of the support strategy, and potential support problems.

1. AN/ARN-148 Omega Navigational System (ONS)

The AN/ARN-148 Omega Navigational System is a state-of-the-art navigational system for aircraft which combines microprocessor technology with a digital receiver design. The ONS comes equipped with a Control Display Unit (CDU), a fully alphanumeric keyboard, and a color display. The Omega

Navigational System detects navigational beacon signals, performs the navigation computations, and presents the information to the operator on the CDU. The ONS may also be interfaced with other aircraft systems (Heading, True Airspeed, and Autopilot). The system uses Built-In-Test (BIT) equipment to detect 95 percent of failures. The system dimensions are 4.9 inches Width x 7.5 inches Height x 16.1 inches Length and weighs 18.2 pounds.

a. *Acquisition Strategy*

The acquisition strategy and the logistic support plan for the ONS were combined in a document known as the "Draft Transition Plan for the AN/ARN 148 Omega Set" [Ref. 16:p. 1-16]. This document included the acquisition strategy, fielding plans, support requirements, and support plans.

The acquisition strategy for the ONS started as part of a Product Improvement Program (PIP). In 1986, the CH-47 Project Manager Office was tasked by the Secretary of the Army to incorporate long range navigation aides as part of a PIP [Ref.3:p. 5]. The Army conducted tests on navigational aide equipment with CH-47 helicopters in 1979. The Army's goal was to improve the long range self-deployment capabilities of selected helicopters. The Army decided the acquisition strategy would be to procure an off-the-shelf commercial navigation system and use a lifetime total contractor support concept. The program office conducted a

market survey to identify qualified companies and awarded the contract in 1986. The Army conducted acceptance tests and flight safety tests before fielding the ONS in 1988. The Army informed the other Services about the Omega Navigational System and the ONS became a joint service program with the Army managing the program in 1987. A total of 359 Omega systems and 119 ONS Data Loader systems were procured at a cost of $8,297,590. The ONS unit cost was $13,700.

One advantage of this acquisition strategy was that the Army knew there were commercially available navigation aids from previous test efforts (conducted in 1979). These test systems were used in the same manner as the commercially available systems and did not require modifications. Thus, the PM was able to tailor the acquisition strategy to commercial requirement specifications because no military specifications existed.

Also, the Army intended to buy a small quantity of systems (359) and did not wish to incur the expenses involved in a full development program. Time to delivery was another consideration. A traditional development program could take as long as eight to sixteen years before fielding any equipment. An NDI acquisition could be fielded much quicker.

b. Support Method

The ONS used a total contractor support concept. Under this support concept, repair of major components and

sub-components were performed by the contractor at the contractor's facilities. The user removed nonoperational units and shipped them directly to the contractor. Spare replaceable units were maintained at the contractor's facilities until there was a requirement to replace a system. The contractor then shipped the replaceable unit to the user with a guaranteed delivery of not more than twenty-four hours. The ONS included built-in-test capability to detect faults and a one-year warranty. In wartime environments, military aircraft will be used to facilitate delivery.

The first maintenance contract was for three years at a cost of $56,750. Currently, the program is under a interim support contract and has obligated $206,100 in funds to cover the cost of maintenance support and additional spares for two years.

According to the interviews conducted, the program office chose this support concept because it was simple, responsive, and supported the acquisition strategy. The concept was simple because the contractor was responsible for, and performed, all the maintenance work. The program office was pleased with the responsiveness of the contractor because the contractor could meet the twenty-four-hour spare replacement requirement. Another reason for using total contractor support was that the ONS had a very low failure rate (exact figures not provided) and was not maintenance intensive.

c. *Potential Logistical Support Problems*

Potential support problems included transportation of spares during wartime and the possibility of the contractor going out of business (although this is not likely). In wartime, there could be an initial lag in switching from commercial transportation to military transportation. Therefore, the project office should insure that deploying units (during conflicts) carry enough spares to cover this contingency.

Market research revealed that other commercial vendors were available as potential backup sources for providing similar systems. However, these systems may be hard to integrate into the helicopters and function in the same manner as the ONS. In addition, the logistical burden would increase due to the requirement to support two different navigation systems at once. Making sure the correct spares went to the correct locations and to the correct aircraft could be a major problem.

2. Secure Telephone Unit (STU) III

The Future Secure Voice System (FSVS) featured a family of user friendly, economical, and secure telephone equipment, for widespread application. The STU III was one of these FSVS systems. Units passed secure voice through a cryptographic device located in the terminal. In addition, the STU III was designed to the same standards as a

conventional office phone and operated over Public Telephone Systems and the Defense Switched Network (DSN).

a. Acquisition Strategy

The acquisition strategy was developed from National Security Agency (NSA) requirements and the results of market surveys that identified promising nondevelopmental alternatives. NDI alternatives were promising because the user's requirement called for a secure communication device to pass voice and facsimile information over conventional telephone lines. Market surveys revealed several commercially available secure communication devices. However, these commercial products did not meet NSA secure cryptographic requirements.

The PM solved this problem by using a Government Furnished Equipment (GFE) cryptographic device to meet NSA requirements. Incorporation of the military cryptographic device was the only difference between the STU III equipment and the commercially available secure office phone equipment.

The PM split the buy among three vendors. This strategy enabled the program to obtain equipment in a timely manner, introduce the latest technology without integration problems, and insure a fair price through competition. System integration was not a problem because any unit can be replaced from any vender and still communicate with any other system. This application would not work if the cryptographic devices

were not GFE. Thus, no problems were reported from integrating new equipment designs with existing equipment. In addition, the GFE was utilized to meet NSA security requirements. Sixty thousand STU IIIs were bought at a cost of $119,700,000. The average unit cost was $1,995.

The respondents indicated that the major advantage of this NDI program was that multiple sources (three vendors) were used to expand the resource base. Therefore, fair and reasonable prices ($1,995 unit cost) could be maintained through competition.

b. Support Method

The STU III used a contractor/organic support concept. Here, depot level designated maintenance (repair/return) was performed through the original equipment manufacturer. For those items identified as user replaceable parts (e.g., handset, powercord, etc.), maintenance repair was conducted by the operator [Ref. 17:p. 3]. Therefore, the equipment was returned to operational use with minimum downtime. Nonoperational units were sent from the user to the Lexington-Blue Grass Army Depot, a Government owned/contractor operated (GOCO) facility. The depot would conduct a simple operational check to determine if the equipment was nonoperational. Elaborate test equipment was not required for this test. The STU IIIs were simply plugged into a commercial telephone jack and power supply to determine if the unit was

nonoperational. If the unit was nonoperational, it was returned to the manufacturer for repair. The depot was responsible for overall stock and issue of STU IIIs spares. Warranties ranged from 12-24 months and contractor repairs were limited to $600 per non-warranty unit repaired (without program office approval). Sixty-three percent or approximately 38,000 of the warranties were for 24 months. The warranty duration varied depending upon the vendors' products.

c. Potential Logistical Support Problems

Potential support problems included integration, shipping costs, and turn around time. The respondents believed the support concept complemented the acquisition strategy (three vendors, three different items) because the vendors were responsible for repairing their own products. Also, support costs were low because the STU III had a very low failure rate (no figures provided).

Responses suggested that integration problems could occur if new or modified GFE equipment was introduced. For these different systems to operate effectively, the cryptographic devices must be compatible with all the systems. If the STU IIIs had high failure rates, shipping costs could be expensive. In addition, the (repair/return) turn around times would increase because all systems must be checked at the depot before they are sent to the contractor for repair.

For example, the average shipping cost to send a potential defective unit from the user to the depot was approximately $38. If the system was nonoperational, an additional $38 would be required to ship the defective unit from the depot to the vendors for repair. A failure rate of 150 systems per month would cost $11,400 or $136,000 per year in shipping costs.

3. AN/PSS-12 Mine Detector

The Mine Detecting Set is a portable detecting system capable of detecting small metallic objects, antipersonnel and antitank mines in any type of environment to include salt water, beaches, and magnetic soils. The set weighs 29.3 pounds and the extended length is 5.3 feet.

a. Acquisition Strategy

The AN/PSS 12 Mine Detector was the only foreign source NDI for this study. The acquisition strategy was to procure the best available military mine detector from the market through a nondevelopmental program. This program started out as a modernization program for the AN/PSS-11 Mine Detector, which was fielded in 1962.

Eventually, the Army experienced problems in procuring spare parts to support the AN/PSS-11. The Army allocated funds for the procurement of the AN/PSS-12 during FY 86. Two successive contractors were unable to produce an acceptable solution because of technical and financial

problems [Ref. 18:p. 1]. The acquisition strategy was then modified to use a military specification with approved performance criteria (from the user), in lieu of a requirements document.

Market analysis revealed that a new surge of commercial militarized mine detectors was available on the commercial market, which would support an NDI strategy. Also, information from the U.S. Marine Corps and NATO was available that supported this strategy. The U.S. Marine Corps and some North Atlantic Treaty Organization (NATO) countries had completed extensive evaluation of several commercially available mine detectors [Ref. 18:p. 1]. The results from these tests were promising. The Army conducted tests on several commercial mine detectors before selecting one vender for the AN/PSS-12 procurement contract.

Once this acquisition strategy was adopted, the mine detector was fielded in approximately two years. The AN/PSS-12 Mine Detector was an example of a commercial item designed to operate in a combat environment. A total of 29,487 AN/PSS-12 Mine Detectors were bought at a cost of $45,994,000. The mine detector unit cost was approximately $1,600 each.

Respondents indicated that an advantage of this acquisition strategy was the ability to tailor the acquisition process. The program overcame early technical development problems by changing the acquisition strategy so that

alternative commercial products could be used. In addition, the program was able to bring foreign sources into the resource pool.

The program office discussed some potential concerns when dealing with a foreign contractor during the interviews. A key question was: "What happens if the foreign contractor's government becomes unfriendly toward our Government?" Respondents indicated that this issue should always be addressed early in the decisionmaking process. In this case, some of this information was a part of the market surveys/analysis.

First, historical performance information was available on contractors. The two countries involved had a long history of military and political cooperation and treaties with the U.S. Also, DOD Foreign Military Sales and State Department policies and guidelines were reviewed as sources of information. Schedule and transportation issues were also addressed.

b. Support Method

The AN/PSS-12 Mine detector used interim contractor support to develop an organic support system. The program office chose to implement an organic support system because some AN/PSS-11 support structures were still in place and could be modified to support the AN/PSS-12. In this case, interim contractor maintenance support was scheduled for the

first two years of fielding to assist in the transition process. All maintenance, except battery replacement and preventive maintenance checks and services, would be accomplished by the contractor during the interim period [Ref. 18:p. 5].

Once organic support was in place, maintenance would be performed by military organizations. All of the components, except the electronic unit, could be discarded upon failure. When the electronic unit failed, it was sent to direct support maintenance for repair. There, the user would receive a replacement unit or wait for a support unit to repair the electronic unit. The electronic unit circuit card would be discarded upon failure. The program was in the first year of contractor support when this research was conducted.

Comments from the respondents indicated that organic support was ideal for this program because of the results from the previous AN/PSS-11 support program. The AN/PSS-11 utilized an organic support system similar to the AN/PSS-12. Much of the maintenance organization and required maintenance skills between the detectors was alike. Also, this support method did not require changes to the force structure. However, interim contractor support was needed for initial fielding, technical manual preparation, and technical support.

c. Potential Logistical Support Problems

Potential support problems included coordination, support responsibilities, and delays. A transition program requires coordination between the PM's office and the contractor to insure that all the requirements are met on time. A transition plan should specify support responsibilities between the Government and the contractor while transitioning from contractor support to organic support. For example, delays in Government preparation could require additional contractor support and increase program costs. Contractor delays could cause the fielding schedule to be postponed if the Government support system is not implemented early. The AN/PSS-12 has included some transition instructions in the Logistic Support Plan and more detailed instructions in the support contract; however, these instructions may not be sufficient for a smooth transition.

4. AN/PSN-11 Precision Lightweight Global Positioning Receiver (PLGR)

The PLGR is one of the NDI commercial receivers integrated into NAVSTAR Global Positioning System (GPS). The GPS consists of 24 satellites, a satellite control segment, and user sets (like the PLGR). The PLGR is a hand held device that was similar to a cellular telephone in size and weight and provides navigation and global position information to the individual user.

a. Acquisition Strategy

A nondevelopmental acquisition strategy was used to develop and procure the PLGR. The program office had prior experience with NDI GPS receivers during Operation Desert Storm Those GPS receivers were used on the PATRIOT Air Defense Missile System, and the Apache helicopter [Ref. 19:p. 2]. All the commercial GPS receivers available required minor military modifications in order to integrate with GPS satellites [Ref. 19:p. 3].

The GPS Project Office expects to award support contracts to multiple vendors in early 1993. Fielding is scheduled in late 1994. The PLGR purchase will be for approximately 35,000 units at cost of $175,000,000. The unit cost will be between $4,000-$6,000 each (depending upon the modification required). (Exact costs could not be released because the contract was under protest at the time of the interviews.) The PLGR program kept the unit cost close to the commercial market cost because it was a large volume procurement (although some minor military modifications were required).

Another advantage for this acquisition strategy was that the program office had a positive experience with commercial GPS receivers during Operation Desert Storm and understood the support requirements. The vendors responded with quality products that met the user's needs and demanding delivery schedules.

b. Support Method

The PLGR program plans to use a contractor/organic support concept similar to the STU III program. In this case, the contractor would conduct all repair maintenance except for those items identified as user replaceable parts, (e.g., handset, powercord, antenna etc.) at a depot. The program considered two depot options. One option was for the unit to return nonoperational PLGRs directly to a Government owned/contractor operated facility for repair [Ref 19:p. 17]. In return, the contractor would send an operational PLGR directly to the unit (direct exchange). The second option was to use the contractor's depot facilities instead of Government Depot facilities. All PLGRs will come with a five-year warranty. Contractor repairs will be limited to $250 per non-warranty unit repaired (without program office approval).

Interview results indicate that the respondents believed the support concept complemented the acquisition strategy because the vendors would be responsible for repairing their own products. Therefore, support costs would be low ($250 per unit repaired). According to the respondents, GPS receivers exhibited a very low failure rate during Operation Desert Storm (no figures provided) and the project office expects similar performance from the PLGR. Integration of new equipment or interoperability with other vendors' products was not a concern because each receiver communicates independently with the GPS satellites. Also,

this method was attractive because it did not affect the force structure. No new maintenance personnel were required because the contractor does all the repair work.

c. Potential Logistical Support Problems

Potential support problems included high failure rates, shipping costs, and turn around times. According to the respondents, if the PLGRs had high failure rates, shipping costs could be expensive and repair/return turn around times could increase. Also, high failure rates would require increases in the inventory to maintain readiness and reduce repair/return turn around times.

D. SUMMARY

- **Contractor Support.**

Each of these programs selected support strategies that best suited their program needs. The Omega Navigational System used total contractor support because the system's reliability characteristics were very favorable and the maintenance plan was simple and responsive. The AN/PSS Mine Detector utilized interim contractor support until an organic support system could be established. A contractor/organic support concept was used by with the STU III program. PLGR chose a contractor/organic support method because the support method complemented the acquisition strategy and the maintenance plan was simple.

- **Market Analysis**

In these cases, market surveys and analysis played important roles in shaping the acquisition and support strategies. Market surveys identified potential commercial products with multiple sources that could meet the programs' operational and support requirements for the STU III and the PLGR. The important advantages from the STU III acquisition were that multiple resources (three vendors) were used to expand the resource base and insure that fair and reasonable prices ($1,995 unit cost) could be maintained through competition. The PLGR followed a procurement strategy similar to the STU III and experienced similar results.

Market surveys also identified foreign sources in the case of the AN/PSS-12 Mine Detector program. Therefore, the program could shift from a developmental program to a nondevelopmental program because a new product was identified. The AN/PSS-12 program kept the unit cost down ($1,600) because the item was an NDI militarized commercial product.

The ONS kept the unit cost affordable ($13,700) with a small quantity buy (359 systems) because the market survey identified a commercial off-the-shelf system that required no modifications. The contractor's repair costs (no more than $600 per unit) and support performance were analyzed and considered acceptable.

- **Omega Navigational System**

The ONS used a total contractor support concept because the maintenance repair/return turn around time was a major concern. The program streamlined the support system because nonoperational units were sent directly from the user to the contractor for repair, and then returned to the user. The program office bought a system that required no unit maintenance, easily replaced spares (plug in/ out), had a low failure rate, and can be shipped by air.

- **Mine Detector**

The program office used interim contractor support until an organic support system could become fully operational. Some organic support mechanisms from the old mine detector program were still in place and were utilized. However, the program office needed time to organize the support structure and insure that it was operational before program implementation. Interim contractor support allowed the program to conduct an orderly transition from total contractor support to organic support.

- **Secure Telephone Unit III**

The STU III chose to employ a contractor/organic (MIX) support system. Contractor maintenance (repair/return) was through the original equipment manufacturers, since the procurement contract was split among three vendors. Nonoperational units were sent from the user to a Government owned/contractor operated depot facility. The depot conducted a simple operational check to determine if the equipment was

nonoperational and should be sent to the contractor for repair. The program office wanted to ensure that the unit was nonoperational before sending them to the contractor for repair.

- **Global Positioning System Receiver (PLGR)**

This program was another example where the program office had experience with a similar acquisition because NDI GPS receivers were procured during Operation Desert Storm. GPS receivers exhibited a very low failure rate during Operation Desert Storm and the program office expects similar performance from the PLGR. Therefore, the PLGR program planned to use a contractor/organic support concept similar to the STU III program. The program office considered two support options: 1) the contractor would conduct all repair maintenance at a Government owned/contractor operated facility; or 2) repair would be conducted at a pure contractor operated facility. The PLGR program considered splitting the procurement contract among multiple vendors, like the STU III program, to expand their resource base and ensure fair prices.

- **Potential Logistic Support Problems**

  Potential problem areas identified were:

  - Wartime transportation.
  - Shipping costs.
  - Contractor survivability.
  - Integration.
  - Transition plans.

NDI programs relying on contractor support considered using military transportation assets as back-up transportation during wartime. Commercial transportation cannot be guaranteed in combat environments. Another concern with commercial transportation is shipping costs. Programs not using organic support relied upon commercial transportation to ship spare parts and for repair/return of nonoperational units.

Contractor solvency was also a concern for NDI programs. Other commercial products may not be suitable substitutes as replacement systems in the event a contractor goes out of business. Product incompatibility and integration was a concern when using multiple vendors.

NDI programs using contractor support to transition to organic or a contractor/organic support mix must ensure that the transition plans clearly define contractor and Government responsibilities. Otherwise the program could experience fielding delays.

- **Other Issues**

DOD does not have a formal information system to gather and access effectiveness of its NDI acquisitions. The Army's Acquisition Management Milestone System (AMMS) was used to collect information on Army NDI programs. However, the listings did not specify the NDIs' procurement methods or the type and degree of nondevelopmental effort.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL CONCLUSIONS

This thesis focused upon contractor support strategies for Nondevelopmental Items (NDI) since nondevelopmental item alternatives usually require a departure from traditional support methods. Alternative logistical support strategies were identified and analyzed from several different major nondevelopmental item acquisitions. These strategies may enable U.S. Army Program Managers to maximize the benefits of using individualized and tailored support strategies for nondevelopmental acquisition. All programs researched appear to have successful logistical support programs. However, several potential logistical support problems were identified.

B. SPECIFIC CONCLUSIONS

- **NDI Is An Important Acquisition Strategy.**

Nondevelopmental item acquisition capitalizes on the use of commercial "state-of-the-art" technologies while providing DOD with effective and economical solutions to operational requirements. Furthermore, NDI acquisition has shown quality trends to be as good as, if not better than, specially developed items when they are purchased to meet a military requirement. Also, nondevelopmental item acquisitions have lowered life cycle costs because NDIs can

usually skip most of the research and development phases of the acquisition process. Simply stated, NDI should be one of the first materiel alternatives considered.

- **NDI Strategy Should Be Implemented Early.**

The decision to use NDI should be made early in the planning process. Then, the support strategy can complement the acquisition strategy. Identification and consideration of support constraints should be conducted early in the acquisition planning process before contract award. Fixes for unanticipated problems usually increase a program's life cycle cost. The benefits of a shorter NDI acquisition cycle are negated if the support system is not in place or is inadequate when a system is fielded.

- **Market Analysis Should Be Conducted For Each NDI Program.**

Market analysis is important in the acquisition planning process because it can identify possible commercial NDI alternatives. The market analysis reveals the strength of the commercial resource base. A strong resource base usually means more competition, more alternatives, and better quality commercial products. The market analysis also helps identify potential risks and constraints in the acquisition and support strategies. Therefore, the market analysis should be conducted early in the planning process.

- **Support Method Should Be implemented Early.**

Since NDI acquisitions have a shorter acquisition cycle than classical acquisitions, logistic planners have less time to plan and implement support systems. Fielding schedules could be delayed if the support system is not in place. The requirements to conduct Logistical Support Analysis, develop Integrated Logistical Support Plans, and approve other program management documents do not change because a program is nondevelopmental.

- **Support Strategy Should Be Tailored To The NDI Program.**

NDI support strategies are flexible and can be tailored. A noncombat Category A NDI may not require any modifications or development to operate in a commercial like environment. The maintenance support plan designed for this item would be ideal for no support (discard upon failure) or total contractor support options (as discussed in Chapter III). A Category B NDI may require organic support or integrate a mix of contractor/organic support even if used in combat. However, total contractor support in combat environments requires more coordination for repair/return operations and spare systems to maintain the availability demands.

- **Contractor Support Considered As A Possible Alternative For Every NDI Program.**

Contractor support can be tailored to almost any support method, even setting up an organic support system. Operation Desert Storm demonstrated how contractor support

could be used in a combat environment. Some programs discovered that contractor support is flexible. The contractor is responsible and preforms all maintenance under the total contractor support method. Contractor depot support is conducted at GOCO and contractor facilities under contractor/organic concepts. Interim contractor support can be used to transition programs from one support method to another.

- **Use Competition For NDI When Possible.**

By using commercial items, DOD can capitalize on economies of scale and achieve effectiveness with quality equipment. Some studies indicate that competitive pressures lead directly to lower system prices. Therefore, by choosing a nondevelopmental acquisition strategy, unit costs of low quantity purchases will be more likely to reflect commercial production costs. Additionally, NDIs are structured to take advantage of the competitive forces in the marketplace because the Government becomes another buyer in a market with many suppliers. Initiatives stimulating efficiency and competition include streamlining weapons systems maintenance operations, and allowing military maintenance depots and private firms to compete for maintenance work.

- **Potential Logistical Support Problems.**

The following potential logistical support problems were identified and should be addressed in all future NDI support plans:

- Wartime transportation requirement.
- Contractor turn around and shipping costs.
- Contractor solvency and industrial base.
- Multiple source item integration and compatibility.
- Transition from contractor to organic support.

C. RECOMMENDATIONS

- **Programs Should Consider NDI As An Alternative Acquisition Strategy.**

NDI alternatives should be considered as viable solutions to some DOD materiel needs. There are many instructions that require the Pms to consider NDI alternatives in the acquisition planning process. The Government should start developmental programs only if NDIs do not fulfill the user's needs. Therefore, NDI alternatives should continue to be considered through all acquisition phases because NDIs can be used to introduce new technologies into existing programs.

- **NDI Programs Should Identify Their Support Strategy Early In The Decisionmaking Process.**

In order for logistical support to be effective, it must be included early in the acquisition planning process. NDIs have a shorter acquisition cycle than a classical development program. Therefore, there could be a tendency to field a system before the support system is operational. The support strategy can complement the acquisition strategy when given equal planning consideration.

- **DOD Should Develop A System To Measure The Effectiveness Of NDI Procurement.**

DOD has no DOD wide information system to track or measure the effectiveness of NDI acquisitions. Listings do not specify NDI procurement methods or the type and degree of nondevelopmental effort. Joint NDI programs are used more frequently to reduce costs and meet Service wide needs. The need for systems integration is increasing, as is the participation of NDIs. Therefore, each service component needs to develop its own system to collect and assess NDI procurement.

D. AREAS FOR FURTHER RESEARCH

- **Foreign NDI Acquisition Alternatives.**

Viable foreign NDI alternatives should be investigated and identified in the market analysis. Further research is necessary in order to establish the criteria for assessing the feasibility of foreign NDI acquisition. Case studies involving current DOD foreign source NDIs could be used to initially identify these criteria. Also, it would be helpful to identify the potential benefits and problems associated with current or past DOD foreign source NDIs.

APPENDIX A: GLOSSARY OF ACRONYMS

AMMS	Acquisition Management Milestone System
ADT	Administrative Delay Time
BIT	Built-In-Test
CD/E	Concept Exploration/Definition Phase
CDU	Control Display Unit
Dem/Val	Concept Demonstration/Validation
DOD	Department of Defense
DSN	Defense Switched Network
EMD	Engineering and Manufacturing Development
FAAF	Forward Area Air Defense
FSVS	Future Secure Voice System
GFE	Government Furnished Equipment
GOCO	Government Owned/Contractor Operated
GPS	Global Positioning System
LDT	Logistic Delay Time
LSA	Logistical Support Analysis
LSAR	Logistical Support Analysis Record
ILS	Integrated Logistical Support
ILSP	Integrated Logistical Support Plan
LOGMARS	Logistic Applications of Automated Marking and Reading Equipment
LRIP	Low-Rate Initial Production
MAA	Mission Area Analysis

MDT	Maintenance Down Time
MIX	Mixed Support
MNS	Mission Need Statement
MTBF	Mean Time Between Failure
MTBM	Mean Time Between Maintenance
MTBR	Mean Time Between Repair
NATO	North Atlantic Treaty Organization
NDI	Nondevelopmental Item
NO	No Support
PLGR	Precision Lightweight Global Positioning System Receiver
POP	Proof-Of-Principle
OMB	Office of Management and Budget
ONS	Omega Navigational System
OS	Organic Support
PM	Program Manager
STU	Secure Telephone Unit
TCS	Total Contractor Support
USD(A)	Under Secretary of Defense for Acquisition

APPENDIX B: NONDEVELOPMENTAL ITEM PREFERENCE POLICY AND DEFINITION

1. United States Code, Title 10, Section 2325 "Preference for nondevelopmental items"

(a) PREFERENCE.--The Secretary of Defense shall insure that, to the maximum extent practicable--
  (1) requirements of the Department of Defense with response to a procurement of supplies are stated in terms of--
    (A) functions to be performed:
    (B) performance required: or
    (C) essential physical characteristics:
  (2) such requirements are defined so that nondevelopmental items may be procured to fulfill such requirements: and
  (3) such requirements are fulfilled through the procurement of nondevelopmental items.

(b) IMPLEMENTATION.--The Secretary of Defense shall carry out this section through the Under Secretary of Defense for Acquisition, who shall have responsibility for its effective implementation.

(c) REGULATIONS.--The Secretary of Defense shall prescribe regulations to carry out this section.

(d) DEFINITION.--In this section, the term "nondevelopmental" means--
  (1) any item of supply that is available in the commercial marketplace;
  (2) any previously-developed item of supply that is in use by the department or agency of the United States, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;
  (3) any item of supply described in paragraph (1) or (2) that requires only minor modification in order to meet the requirements of the procuring agency; or
  (4) any item of supply that is currently being produced that does not meet the requirements of paragraph (1), (2), or (3) solely because the item--

(A) is not yet in use; or
(B) is not yet available in the commercial marketplace.

APPENDIX C: INTERVIEW QUESTIONS

1 **Primary Research Question:**

Should the Department of Defense (DOD) utilize total contractor support for Nondevelopmental Item (NDI) acquisitions?

2 **Subsidiary Research Questions**

(a) What is nondevelopmental item acquisition?
  (1) Is NDI acquisition different from a system under full development?
  (2) What was the reason(s) for choosing an NDI solution?

(b) What are the most commonly used logistical support strategies in nondevelopmental item acquisition?
  (1) What support system did your program choose, no support, contractor/commercial, organic, or a mix?
  (2) What were the advantages and disadvantages of your support system?
  (3) When, during the acquisition process, was the support system considered?

(c) What logistical support requirements are considered in the design of nondevelopmental item acquisition support systems?
  (1) Was cost a consideration?
  (2) Was schedule/delivery a consideration?
  (3) Was contractor performance a consideration?

(d) How does the anticipated operational environment affect the logistical support strategy?
  (1) What program characteristics affect how the system will be supported?
  (2) What system use characteristics affect how the system will be supported?
  (3) Was the NDI strictly an "off-the-shelf" item or did it require minor modifications because of its operational environment?

(e) Are Integrated Logistical Support Plans (ILSPs) aligned to the acquisition strategy?
  (1) Does the program have an ILSP?
  (2) If not, what is the program using for an ILSP?

APPENDIX D: LIST OF PERSONS INTERVIEWED

This research effort included interviews with the following individuals:

1. Guest, Dan. Brigadier General (USA). Program Executive Officer for Communications Systems, U.S. Army Communications and Electronic Command. Ft. Monmouth, NJ. 4 March, 1992.

2. Jansons, Pete. Product Manager for Modular Azimuth Positioning System. Picatinny Arsenal, NJ. 5 November, 1992.

3. Lading, Mike. Deputy Program Manager for FSVS. U.S. Army CEOCOM Communication Logistics Support Activity, UT. 23 February, 1993.

4. McGhee, Michael. Program Manager for AN/PSS-12. U.S. Army Aviation and Troop Support Command, St. Louis, MO. 15 January, 1993.

5. Mulligan, Don. Lieutenant Colonel (USA). Logistics Manager for NDI Support. Logistics Support for NDI Products, U.S. Army Communications and Electronic Command. Ft. Monmouth, NJ. 6 January, 1993.

6. Ohliber, Ron. Director, Electronics Integration Directorate Research and Development, U.S. Army Communications and Electronic Command. Ft. Monmouth, NJ. 12 December 1992.

7. Riggs, Gary. Logistics Support Integrator. U.S. Army CEOCOM Communication Logistics Support Activity, UT. 12 January, 1993.

8. Sweeny, Bruce. Colonel (USA). Project Manager. U.S. Army Communications and Electronic Command. Ft. Monmouth, NJ. 21 May, 1992.

9. West, Lynn. Program Manager for FSVS. U.S. Army CEOCOM Communication Logistics Support Activity, UT. 5 January, 1993.

10. Woods, Beverly. Logistics Manager. U.S. Army Aviation and Troop Support Command, St. Louis, MO. 15 January, 1993.

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17. Program Manager Plan. "Integrated Logistics Support Plan for the Future Secure Voice System Secure Telephone Unit (STU) III Program." Prepared by PMO, CECOM (Communications Security Logistics Activity). Ft. Huachuca, AZ. August 1992.

18. Program Manager Plan. "Logistics Support Plan for Detecting, Mine, Metallic, Portable, AN/PSS-12." Prepared by PMO, TROSCOM, St. Lewis, MO. 20 April 1992.

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